

Claim(s)

1. A haptic information presentation system, comprising:

a haptic presentation unit having two eccentric rotators; and

a control unit that independently changes a frequency and an intensity of a vibration and/or a vibrationsensation by controlling rotation directions, a phase relation and rotation speeds of the two eccentric rotators.

2. A haptic information presentation system, comprising:

a haptic presentation unit having two eccentric rotators; and

a control unit that independently changes a frequency and an intensity of a force and/or a force sensation by inverting rotation directions in the two eccentric rotators.

3. A haptic information presentation system, comprising:

a haptic presentation unit having an eccentric rotator array in which plural single eccentric rotators, and/or plural twin eccentric rotators each having two eccentric rotators, and/or plural twin eccentric rotators arranged in a three-dimensional space are arranged two-dimensionally or three-dimensionally; and

a control unit to control a rotation state of each of the eccentric rotators included in the haptic presentation unit.

4. The haptic information presentation system according to claim 3, wherein

the eccentric rotator array is worked to form a skin-shaped eccentric rotator array, and

a vibration changing spatially and temporally and/or a vibration sensation, a torque and/or a torque sensation, or a force and/or a force sensation is presented according to a control mode of the control unit.

5. The haptic information presentation system according to claim 4, wherein by setting the control mode of the skin-shaped eccentric rotator array, one of a vibration, a force, a shear force, a torque, a resultant torque to twist a palm or a finger or another whole presentation object, a shape feeling of a three-dimensional object caused by presentation of a three-dimensional resisting force, an elastic feeling, a tactile sensation, a feeling in which a force is transmitted on a palm or a finger or another presentation object, a feeling in which a material rolls on a palm or a finger or another presentation object, a feeling in which a force, a vibration or a torque passes through a palm or a finger or another presentation object, and a texture of a surface of a virtual object is presented.

6. A haptic information presentation system, comprising:

a haptic presentation unit having plural rotators arranged three-dimensionally; and

a control unit to control a temporal change of resultant angular momentum vector of the haptic presentation unit,

wherein the control unit generates a torque with a fixed value by abruptly changing the resultant angular momentum vector in a vicinity of zero, and controls a precession torque to be a specified value or less.

7. The haptic information presentation system according to any one of claims 1 to 6, wherein the haptic presentation unit has a shape mountable on a portable communication equipment or a mobile electronic equipment.

8. A haptic information presentation method, wherein when a haptic presentation unit having two eccentric rotators is controlled,

a frequency and an intensity of a vibration and/or a vibration sensation are independently changed by controlling rotation directions, a phase relation and rotation speeds in the two eccentric rotators.

9. A haptic information presentation method, wherein when a haptic presentation unit having two eccentric rotators is controlled,

a frequency and an intensity of a force and/or a force

sensation are independently changed by inverting rotation directions in the two eccentric rotators.

10. A haptic information presentation method, wherein when a control is made on a haptic presentation unit having an eccentric rotator array in which plural single eccentric rotators, and/or plural twin eccentric rotators each having two eccentric rotators arranged on a same rotation axis, and/or plural twin eccentric rotators arranged in a three-dimensional space are arranged two-dimensionally or three-dimensionally,

a rotation state of each of the eccentric rotators included in the haptic presentation unit is individually controlled.

11. The haptic information presentation method according to claim 10, wherein

the eccentric rotator array is worked to form a skin-shaped eccentric rotator array, and

a vibration changing spatially and temporally and/or a vibration sensation, a torque and/or a torque sensation, or a force and/or a force sensation is presented.

12. The haptic information presentation method according to claim 11, wherein by setting a control mode of the skin-shaped eccentric rotator array, one of a vibration, a force, a shear force, a torque, a resultant torque to twist a palm or a finger or another whole presentation object, a shape feeling of a three-dimensional object caused by presentation

of a three-dimensional resisting force, an elastic feeling, a tactile sensation, a feeling in which a force is transmitted on a palm or a finger or another presentation object, a feeling in which a material rolls on a palm or a finger or another presentation object, a feeling in which a force, a vibration or a torque passes through a palm or a finger or another presentation object, and a texture of a surface of a virtual object is presented.

13. A haptic information presentation method, wherein when a haptic presentation unit having plural rotators arranged three-dimensionally is controlled, a temporal change of a resultant angular momentum vector of the haptic presentation unit is controlled, and

a torque with a fixed value is generated by abruptly changing the resultant angular momentum vector in a vicinity of zero, and a precession torque is controlled to have a specified value or less.

14. The haptic information presentation system according to any one of claims 1 to 7, wherein

the haptic presentation unit includes a rotation unit to rotate the eccentric rotator,

the control unit controls a rotation state of the rotation unit included in the haptic presentation unit, and

the rotation unit rotates together with the eccentric rotator to be rotated.

15. The haptic information presentation system according to any one of claims 1 to 7 and 14, wherein the haptic presentation unit includes a fin rotated together with the eccentric rotator, and a fluid surrounding the fin.

16. The haptic information presentation system according to claim 15, wherein

the fluid is air, and

the haptic presentation unit includes a hole opposite to the fin and communicating with outside.

17. The haptic information presentation system according to any one of claims 1 to 7, 14 and 15, further comprising an input unit to input external information to the control unit,

wherein the control unit controls a rotation state of each of the eccentric rotators included in the haptic presentation unit in accordance with the external information inputted from the input unit.

18. The haptic information presentation system according to claim 17, wherein

the haptic presentation unit includes the input unit and the control unit, and

the haptic presentation unit itself is the haptic information presentation system.

19. The haptic information presentation system according to any one of claims 1 to 7, and 14 to 18, wherein

piezoelectric elements are used instead of the eccentric rotators, and

the control unit controls a voltage of each of the piezoelectric elements included in the haptic presentation unit.

20. The haptic information presentation system according to any one of claims 1 to 7, and 14 to 18, wherein magnets are used instead of the eccentric rotators, and the control unit controls a voltage of each of the magnets included in the haptic presentation unit.

21. The haptic information presentation system according to any one of claims 1 to 7, and 14 to 18, wherein material particles of the two eccentric rotators rotate around a same rotation axis on a same plane.

22. A haptic presentation device of a haptic information presentation system, comprising a function of a haptic presentation unit of a haptic information presentation system according to any one of claims 1 to 7, and 14 to 21.

23. A control device of a haptic information presentation system, comprising a function of a control unit of a haptic information presentation system according to any one of claims 1 to 7, and 14 to 21.